weißensee kunsthochschule berlin

workshop 04.-06. May 2015

SENSORIAL WORKSHOP – DEVELOPING A MATERIAL LANGUAGE THROUGH OBJECTS

BRIDGING THE DISCIPLINARY GAP BETWEEN DESIGNERS AND MATERIALS ENGINEERS

Prof. Dr. Mark Miodownik
The Institute of Making

This documentation gathers the outcomes of the three days workshop **DEVELOPING A MATERIAL LANGUAGE THROUGH OBJECTS TO ENABLE TECHNICAL COLLABORATIONS** as well as topics of the one-day symposium by materials experts.

The workshop was led by Prof. Dr. Mark Miodownik within the framework of the semester project »Materiality & Sensorial Research« supervised by Prof. Dr. Zane Berzina, taking place at weissensee kunsthochschule berlin, Textile- and Surface Design, in May ’15.

The objects are isomorphic sets of material stimuli which are used as tools to bridge the disciplinary gap between designers and materials engineers.

SENSORIAL

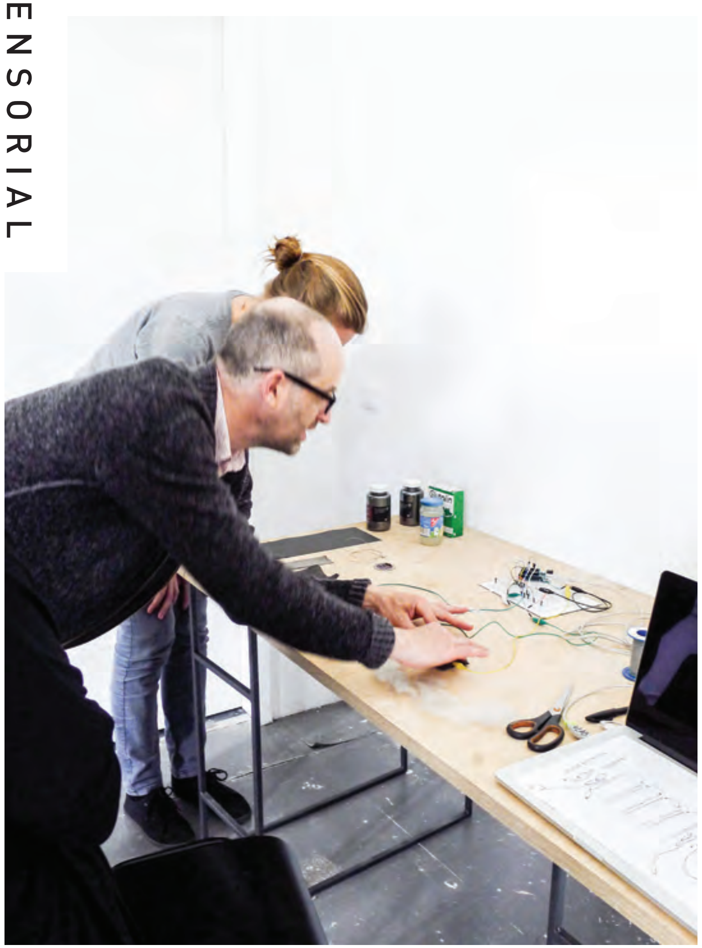
WORKSHOP

During the »Sensorial Workshop« the aim was to develop a material language through objects to enable technical collaborations.

Students were introduced to the specific Institute's of Making methodology by Prof. Dr. Mark Miodownik.

SENSORIAL

WORKSHOP



SPINNING

an archive of self spun yarns

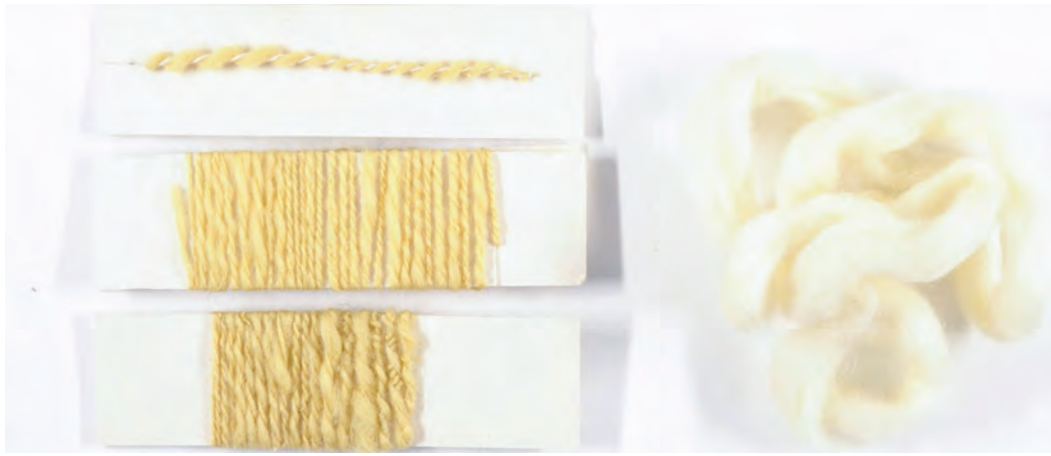
A self-constructed spinning machine was used to create a yarn collection.

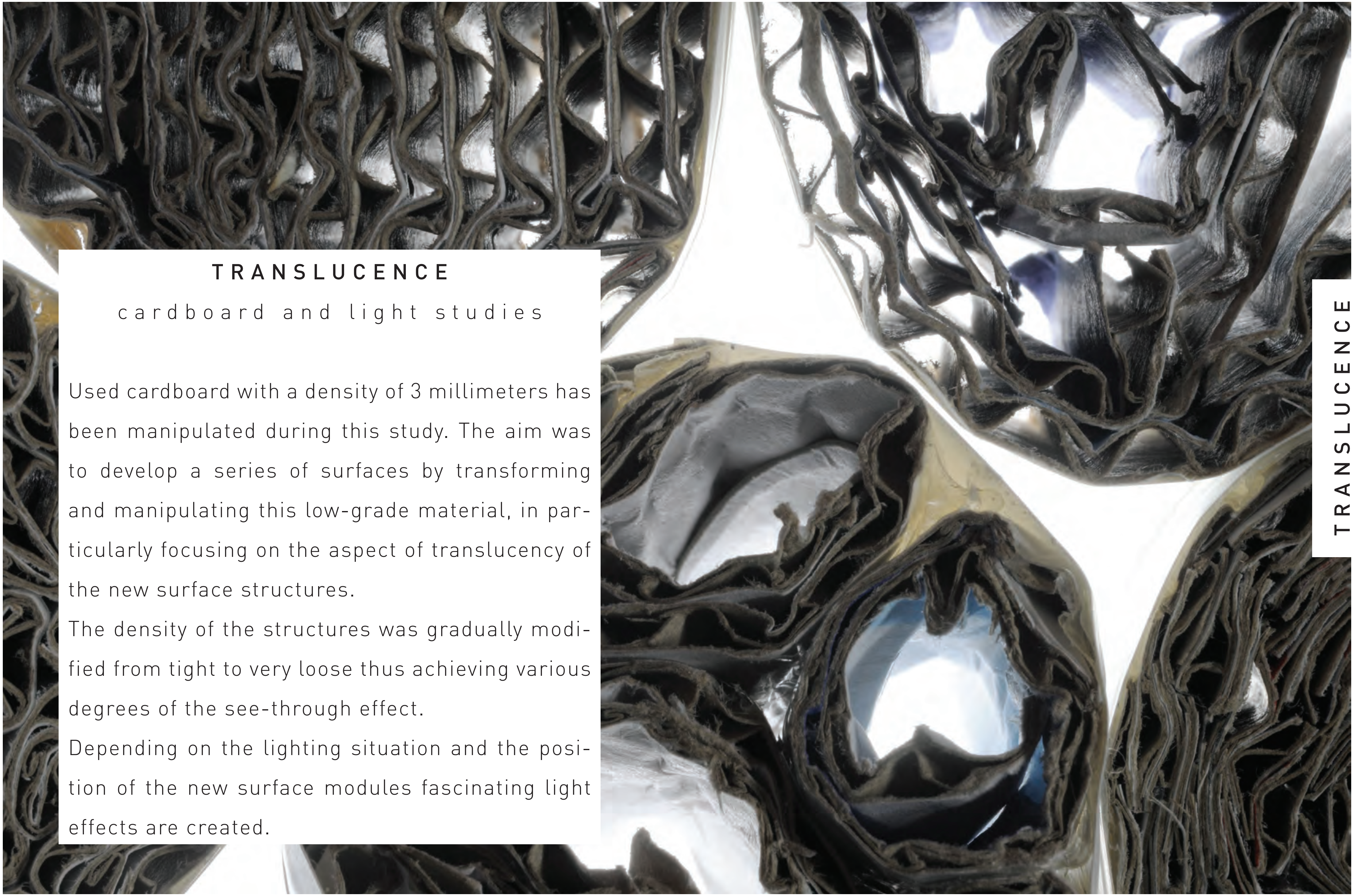
For the set traditional fibers were spun together alone or in combination with other unconventional materials such as feathers, moss, paper, etc. In order to spin a yarn it is necessary to have fibers of a certain minimum length, depending on the material. Here a small selection of tests is shown.

These experiments are the beginning of an archive of self spun yarns, where tests are categorized by materials, spinning speed, twisting and thickness.

Experimental spinning of: hemp, wool, paper, plastic and steel wool

SPINNING





TRANSLUCENCE

cardboard and light studies

Used cardboard with a density of 3 millimeters has been manipulated during this study. The aim was to develop a series of surfaces by transforming and manipulating this low-grade material, in particularly focusing on the aspect of translucency of the new surface structures.
The density of the structures was gradually modified from tight to very loose thus achieving various degrees of the see-through effect.
Depending on the lighting situation and the position of the new surface modules fascinating light effects are created.

TRANSLUCENCE

A range of cardboard surface
modules with various opacities,
corrugated cardboard, 3mm thick
above
B 05,51g
right

A 06,88g	C 08,17g
D 09,69g	E 08,49g
F 13,19g	G 13,44g

POROSITY

traces

Traces of usage often disrupt the intended performance of designed objects. As a result they are judged as flaws. They are part of environmental interaction.

The work focuses in the question how it is possible to create a formal and functional meaning within objects.

The following series of tests investigate the porosity (the ability to infiltrate) and abrasion characteristics of different materials to understand their capacity of achieving and preserving traces. Aiming to learn from renowned classics of »attractive aging«, selected qualities are transferred into synthetic materials.

Range of test »hand-charmers«

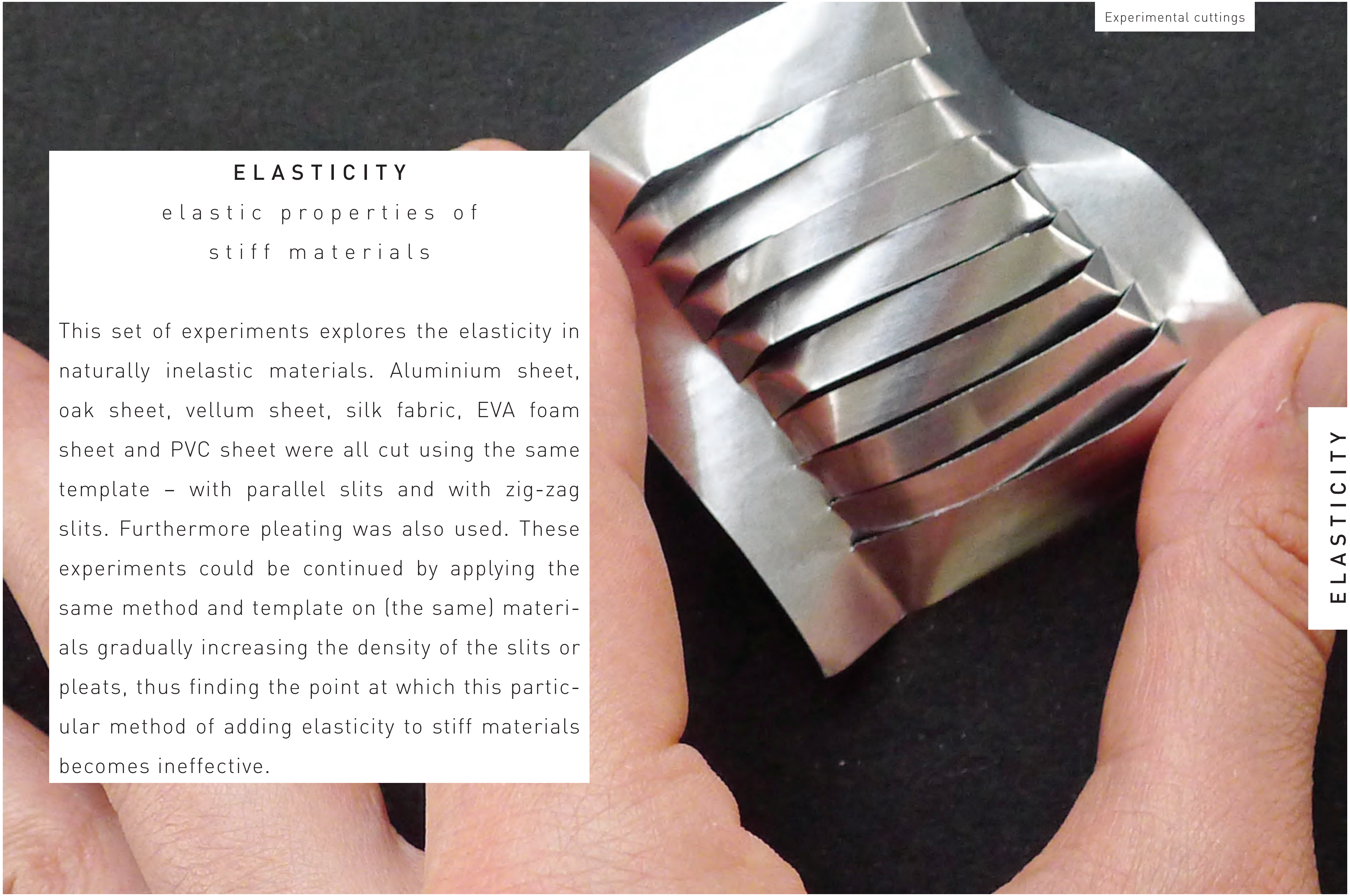
Abrasion: tarnish rubber, hard plastic, two hard foams of different density, fiber composite, wood, concrete, unfired clay

A fascinating opportunity of achieving traces is given by metals that are able to generate patina. Here copper treated with vinegar and salt

POROSITY

Porosity left to right: hard foams of different densities, fiber, composite, wood, leather, unfired clay, concrete, aluminium

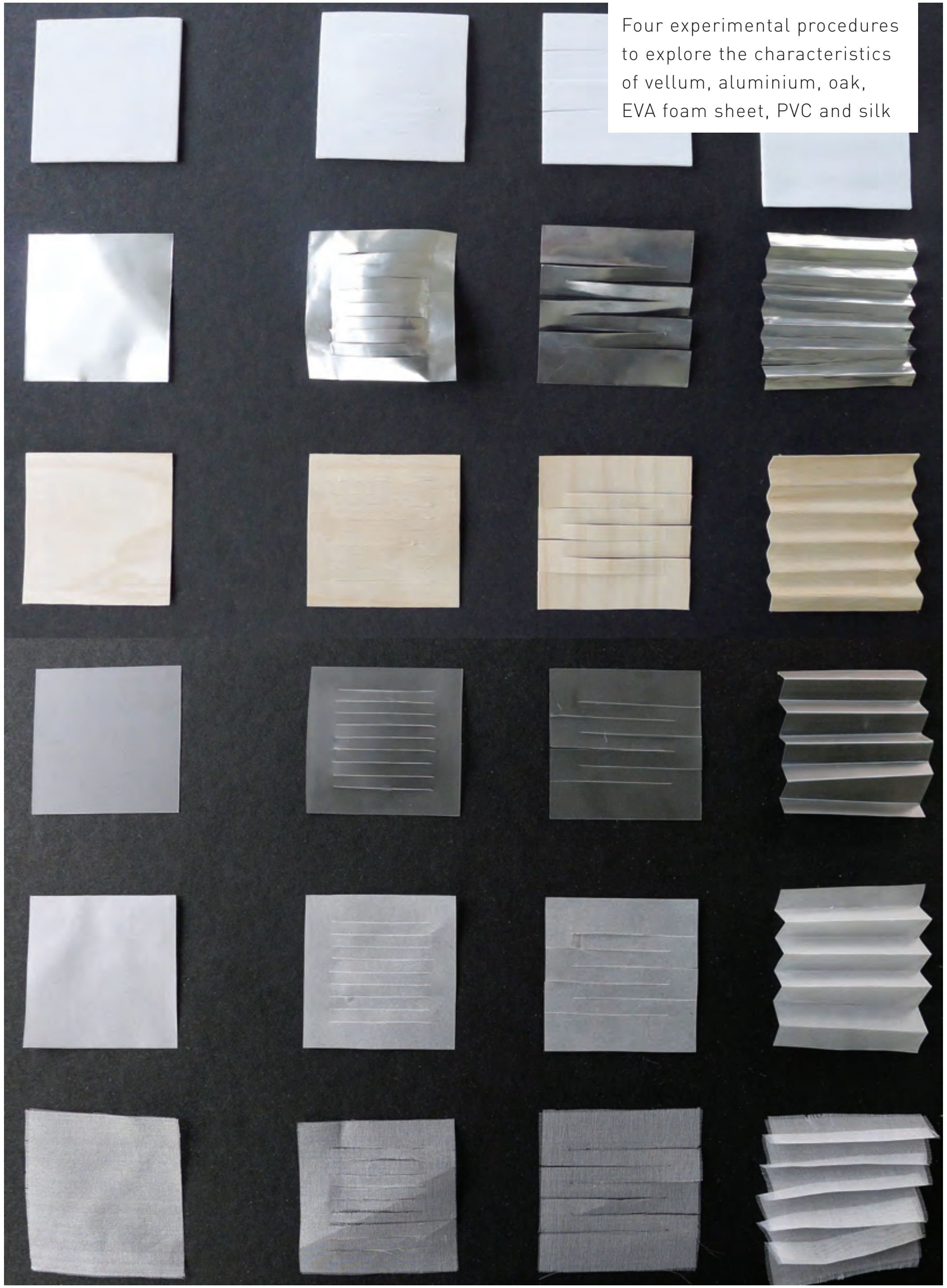
Assembled sets to communicate detected qualities tangibly



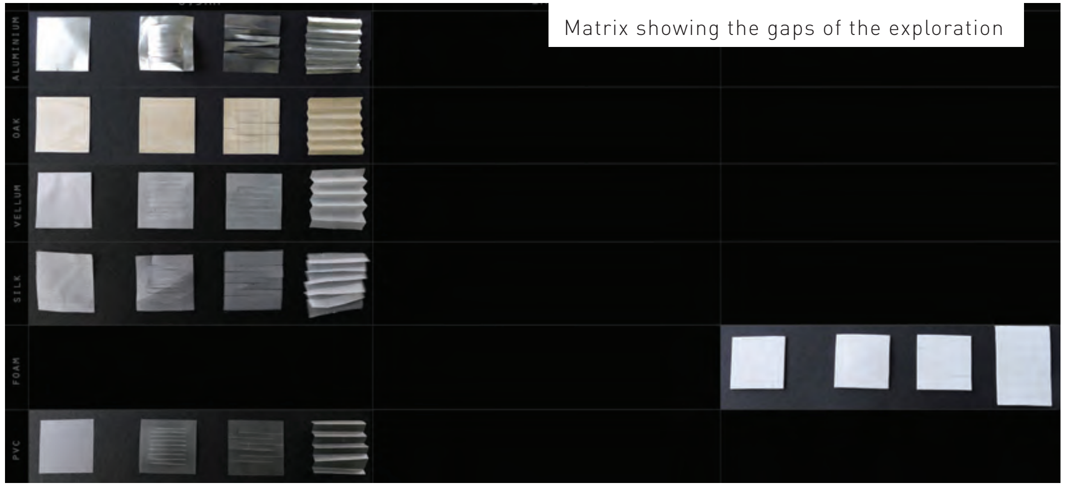
ELASTICITY

elastic properties of stiff materials

This set of experiments explores the elasticity in naturally inelastic materials. Aluminium sheet, oak sheet, vellum sheet, silk fabric, EVA foam sheet and PVC sheet were all cut using the same template – with parallel slits and with zig-zag slits. Furthermore pleating was also used. These experiments could be continued by applying the same method and template on (the same) materials gradually increasing the density of the slits or pleats, thus finding the point at which this particular method of adding elasticity to stiff materials becomes ineffective.

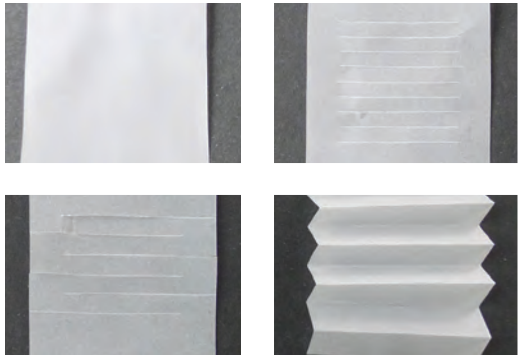


Four experimental procedures to explore the characteristics of vellum, aluminium, oak, EVA foam sheet, PVC and silk

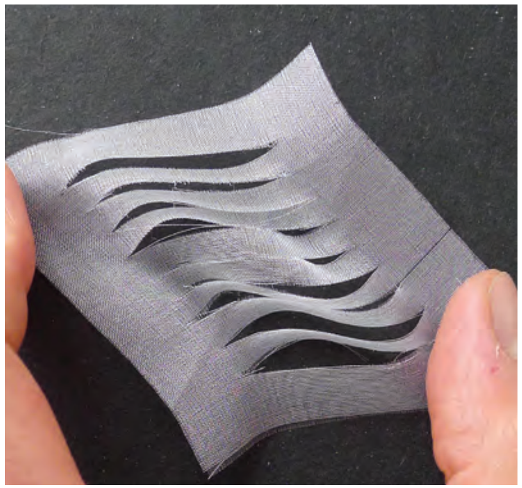


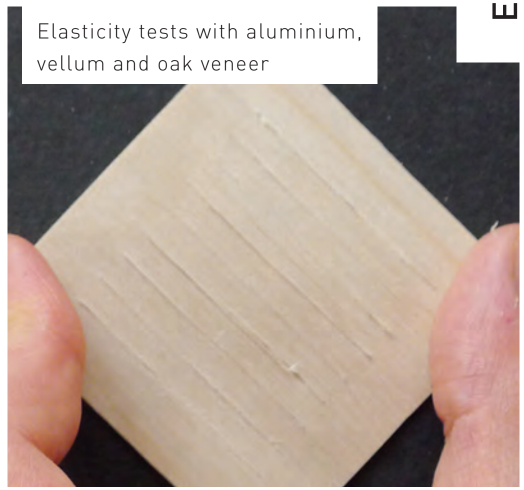
Matrix showing the gaps of the exploration

Vellum, parallel slits, zig-zag slits and pleating



ELASTICITY





Elasticity tests with aluminium, vellum and oak veneer

Different sizes generate different sounds

PENG

the sound of a wine bottle, cork and air

The characteristic sound of opening a bottle of wine is beeing explored and simulated with different materials.
The sound comes from the friction of cork and air.
Materials: cork, paper, aluminium foil, foam.

The sound »peng« from cork to foam is »loud« to »low«

»Peng« sounding the same but generated with different materials

Experiments with plugs in a row from »hard« to »soft«, paper, cork, baking paper, aluminium, foam

FOLD

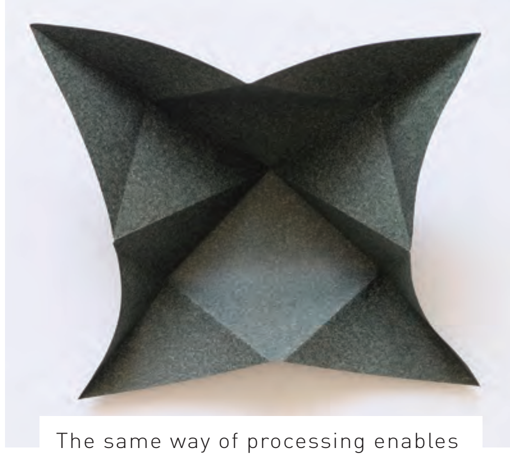
the folding sheet experiment

There are many materials that, if presented in the same manner (eg. as a DIN A4 size sheet) seem to be relatively similar at the first view.

But what happens when you start to fold these materials by hand? How their microstructures react to this procedure?

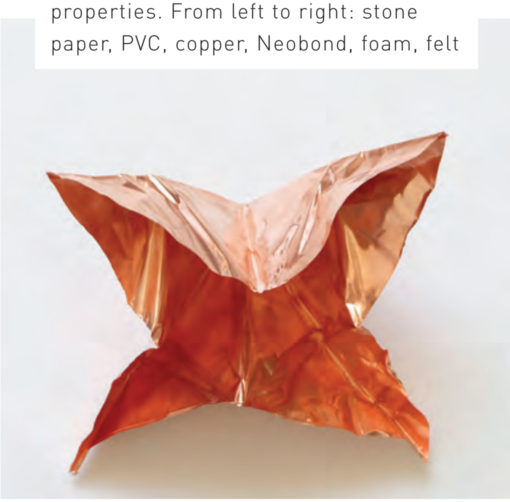
This excursion through materials explores nine different sheet materials starting from a thin transparent paper through to a copper and finishing with a porcelain.

The folded outcomes demonstrate the various degrees of resistance these selected materials perform once folded.



Materials chosen vary highly in haptic properties. From left to right: stone paper, PVC, copper, Neobond, foam, felt

The same way of processing enables to compare the materials. F.l.: decor, cover & transparent papers



Folding experiments during the workshop

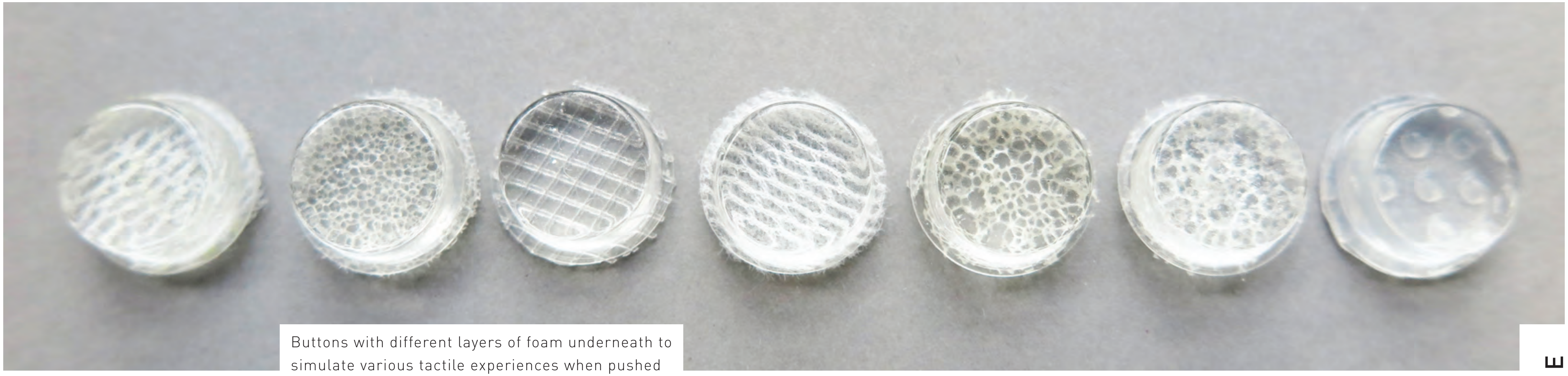
FOLD

HAPTIC RESISTANCE

feel the button

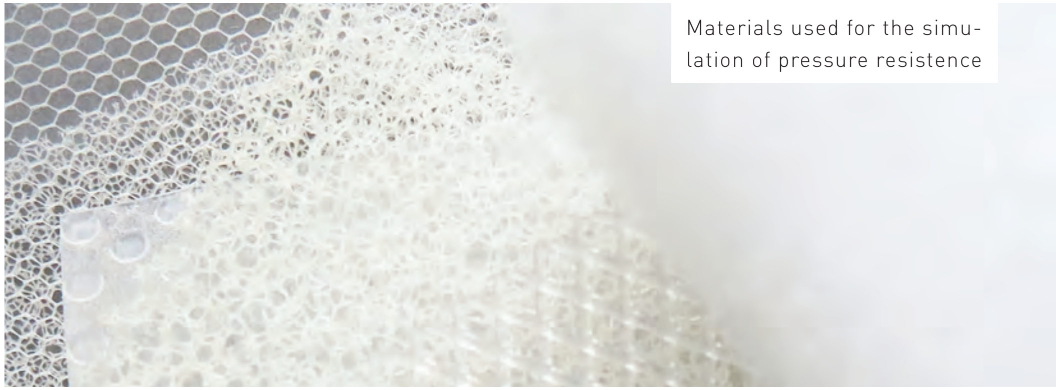
The project deals with the tactile resistance of materials which one experiences when pressing buttons.

The experiments explore the changeable conditions of such haptic interfaces by employing different kinds of foams with various porosities.



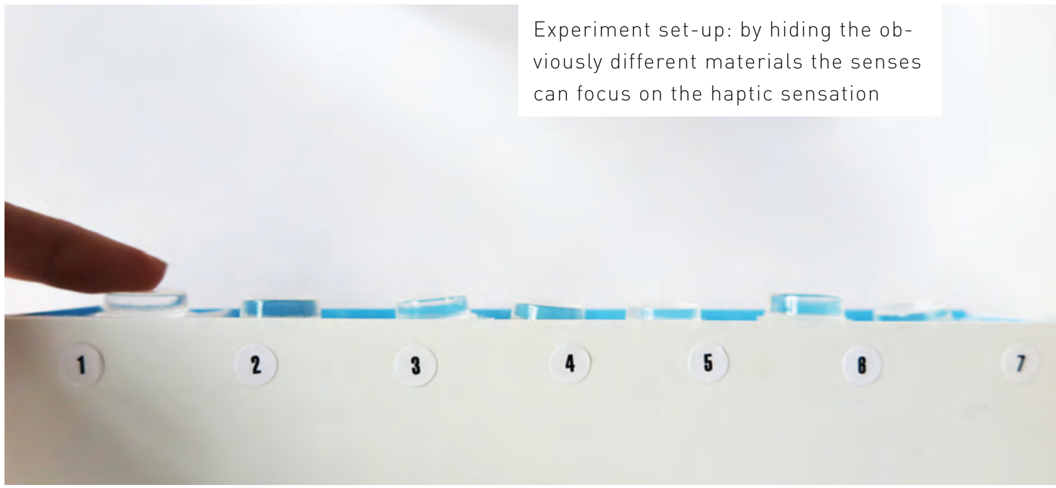
Buttons with different layers of foam underneath to simulate various tactile experiences when pushed

RESISTANCE

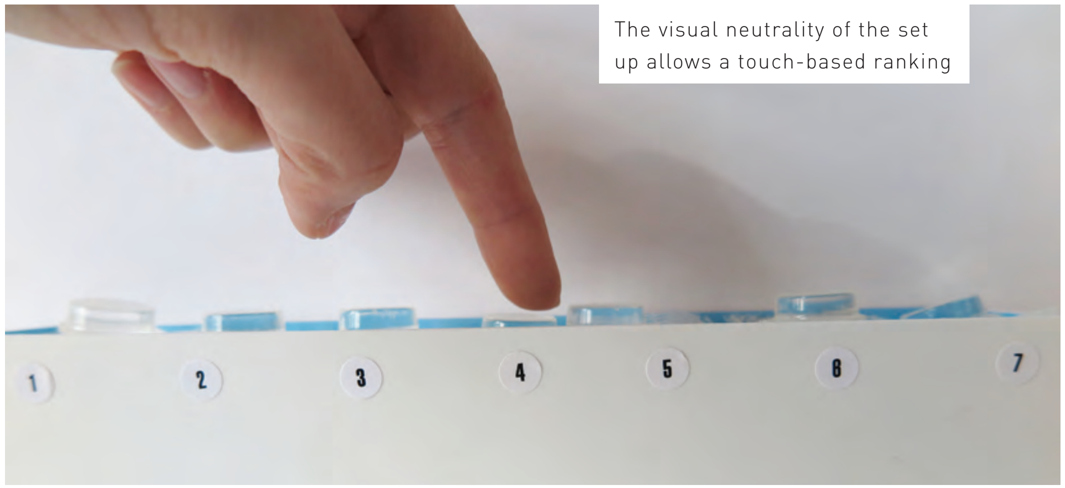


Materials used for the simulation of pressure resistence

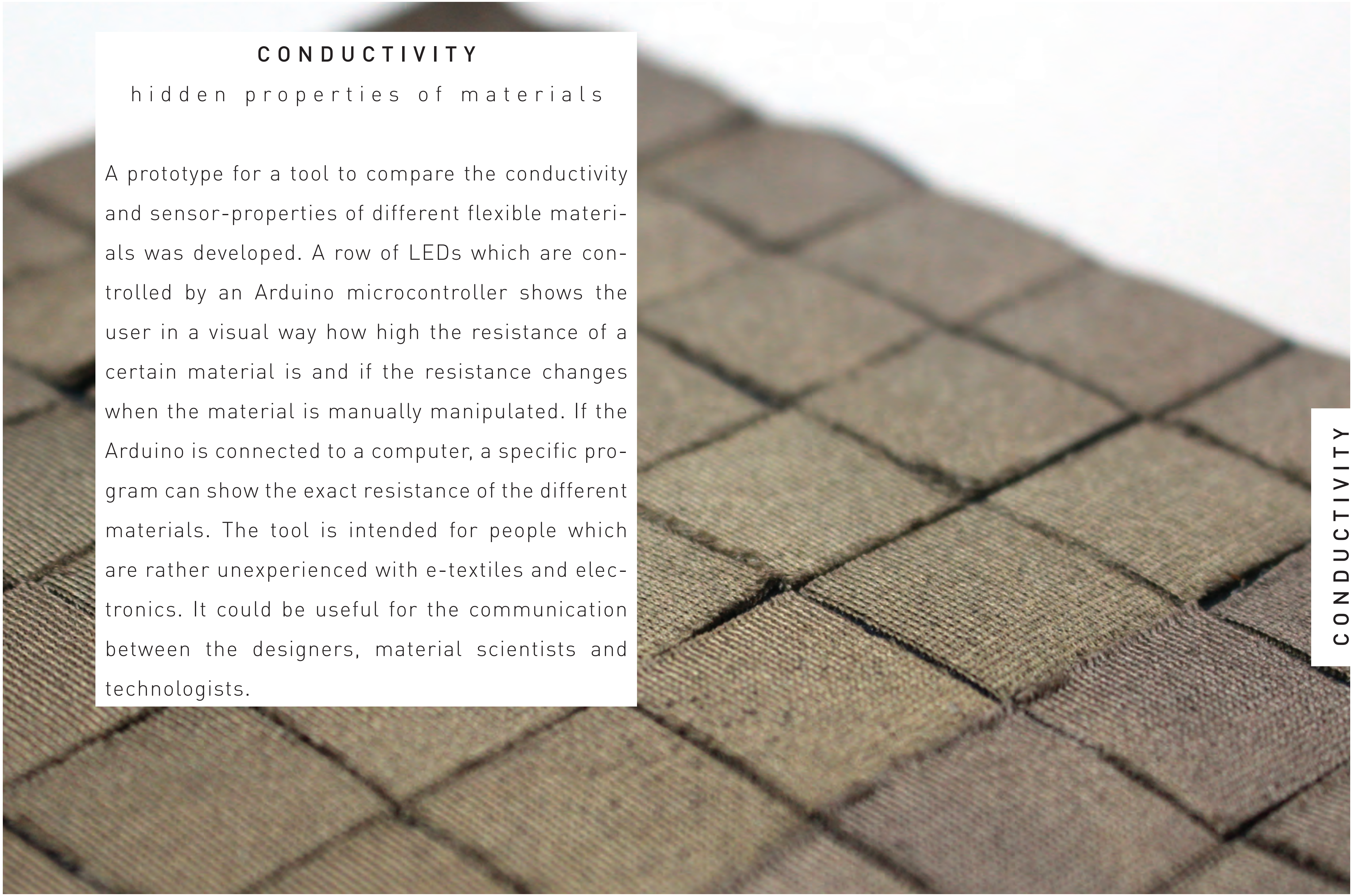
Close-up of button



Experiment set-up: by hiding the obviously different materials the senses can focus on the haptic sensation



The visual neutrality of the set up allows a touch-based ranking



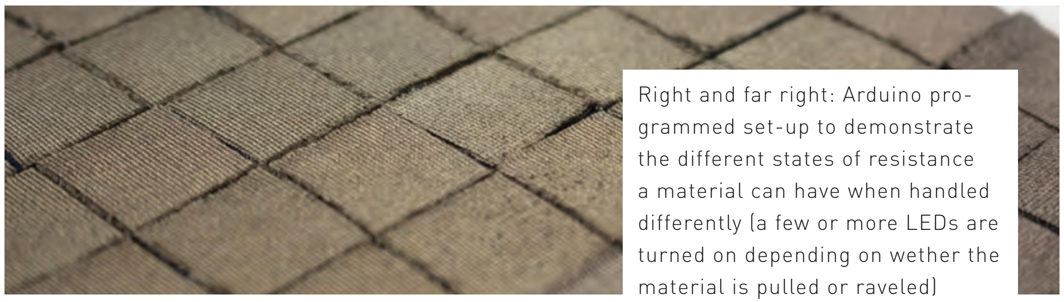
CONDUCTIVITY

hidden properties of materials

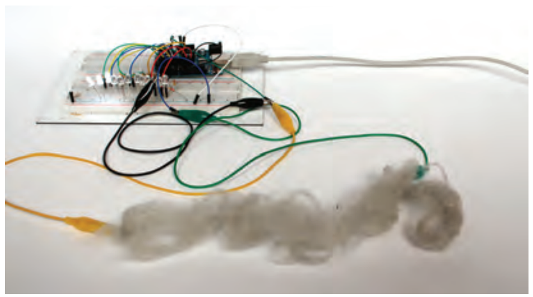
A prototype for a tool to compare the conductivity and sensor-properties of different flexible materials was developed. A row of LEDs which are controlled by an Arduino microcontroller shows the user in a visual way how high the resistance of a certain material is and if the resistance changes when the material is manually manipulated. If the Arduino is connected to a computer, a specific program can show the exact resistance of the different materials. The tool is intended for people which are rather unexperienced with e-textiles and electronics. It could be useful for the communication between the designers, material scientists and technologists.

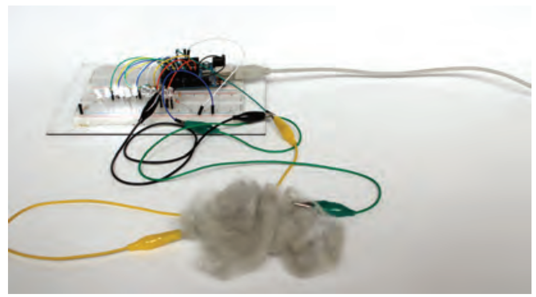
CONDUCTIVITY

Experimental set-up for a visual and tangible understanding of the materials' properties in terms of conductivity



Right and far right: Arduino programmed set-up to demonstrate the different states of resistance a material can have when handled differently (a few or more LEDs are turned on depending on wether the material is pulled or raveled)





FUTURE MATERIALS

the imminent changes to the material world

There are living things that we call life, and there are non-living stuff which we call rocks, tools, buildings and so on. As a result of our greater understanding of matter, this distinction is now becoming blurred and is likely to usher in a new materials age: bionic people with synthetic organs, bones and even brains will be the norm. Just as we become more synthetic, so our man-made environment will change to become more lifelike, living buildings, and objects that heal-themselves are becoming a reality.

TALK I

Lecture
»The History of Glass«
Prof. Dr. Mark Miodownik

SMART³ MATERIALS

introduction to

shape change materials

Experts from the three Fraunhofer Institutes gave short insights into their research topics: the development of intelligent materials that have the abbility to change their shape self-sufficiently by reacting to their surrounding environment.

The research project smart³ is aiming to push the bounderies and exploit the full potential of these shape changing materials for design and engineering.

SMA

SHAPE MEMORY ALLOY

EAP

ELECTRO ACTIVE POLYMER

PIEZO

PIEZO CERAMIC

TALK II

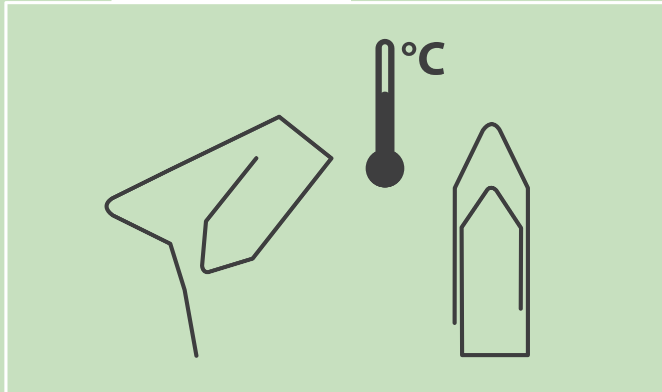
Speakers
SMA Kenny Pagel
Fraunhofer Institute IWU in Dresden
EAP Dr. Miriam Biedermann
Fraunhofer Institute IAP in Potsdam
PIEZO Dr. Andreas Schönecker
Fraunhofer Institute IKTS in Dresden

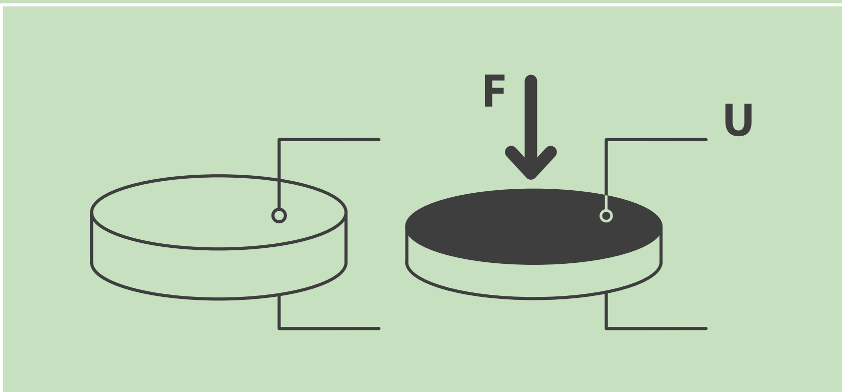
SHAPE MEMORY ALLOYS convert a thermal input in a mechanical output.

ELECTRO ACTIVE POLYMERS expand and contract when connected to an electric current.

PIEZO CERAMICS use mechanical energy to generate electricity and vice versa.

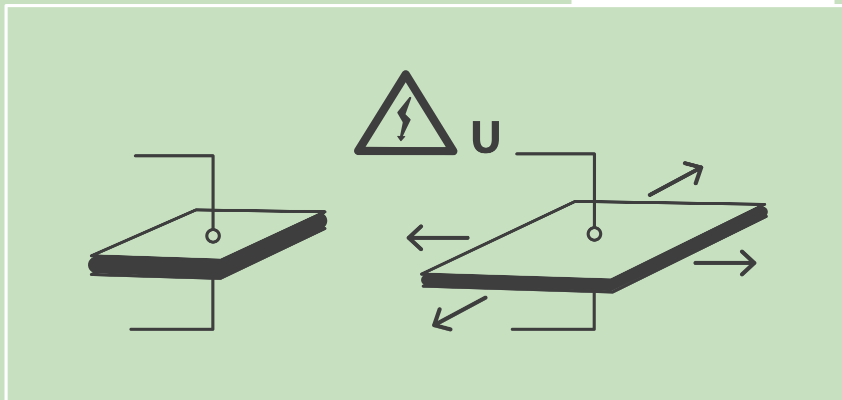
Shape Memory Alloy





Piezo Ceramic

Electro Active Polymer



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BERLIN, JUNE 2015

THANK YOU

smart³ materials solutions growth

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